Japanese Society of Systematic Zoology

Species Diversity, 2004, **9**, 67–76

A Collection of Spider Mites (Arachnida: Acari: Tetranychidae) from Sumatra

Shôzô Ehara

Hamasaka 2-15-7, Tottori, 680-0001 Japan
E-mail: eharash@ncn-t.net

(Received 13 May 2003; Accepted 6 August 2003)

Five species of the family Tetranychidae are reported for the first time in Sumatra, Indonesia. One of these species is described as new to science: *Oligonychus sumatranus* sp. nov. from *Pithecellobium dulce* (Roxb.) Benth. The new species is distinctive in that tibia I has eight tactile setae and the aedeagus gently bends ventrad to form a slender, nearly straight distal hook. The female of *Schizotetranychus malayanus* Ehara, 1988, previously unknown, is described; leg I of some females is recognized to exhibit the chaetotaxy similar to that in males.
Key Words: Acari, fauna, Indonesia, new species, *Oligonychus sumatranus*, spider mites, Sumatra, Tetranychidae.

Introduction

Spider mites of Indonesia have been reported by many workers, namely, Zehntner (1897), Kalshoven and Van der Vecht (1950), Ehara (1969a), Gutierrez *et al.* (1979), Flechtmann (1981), Corpuz-Raros (1989), Johnston and Flechtmann (1990), Masaki (1991), Gutierrez (1992), and Bolland *et al.* (1998). So far as I am aware, the following 14 species of Tetranychidae have hitherto been recorded from Indonesia: *Aponychus corpuzae* Rimando, 1966; *Sinotetranychus vannus* (Rimando, 1968); *Panonychus citri* (McGregor, 1916); *Schizotetranychus lechrius* Rimando, 1962; *S. malayanus* Ehara, 1988; *Oligonychus coffeae* (Nietner, 1861); *O. exsiccator* (Zehntner, 1897); *O. kadarsani* Ehara, 1969; *O. thelytokus* Gutierrez, 1977; *Tetranychus kanzawai* Kishida, 1927; *T. lombardini* Baker and Pritchard, 1960; *T. piercei* McGregor, 1950; *T. truncatus* Ehara, 1956; *T. urticae* Koch, 1836. Many of these species were found to occur in Java, while none of them has been previously recorded from Sumatra.

This paper reports on a small collection of spider mites from Sumatra. The collection is recognized to include one undescribed and four named species. The materials were collected in West Sumatra by Dr. Akio Takafuji, Kyoto University, during December of 1981.

The setal notations used in this paper follow Lindquist's (1985) system. All measurements are given in micrometers, and those of the holotype of the new species are shown in parentheses following the mean. The holotype and some of the paratypes of the new species are deposited in the collection of the National Science Museum, Tokyo; the remainder of the paratypes will be retained in the Museum Zoologicum Bogoriense, Bogor, Indonesia.

NII-Electronic Library Service

Japanese Society of Systematic Zoology

Eutetranychus orientalis (Klein, 1936)
(Fig. 12)

Anychus orientalis Klein, 1936: 107, fig. 1 (type locality: Israel; type host: citrus); Zacher in Klein 1936: 107, *nomen nudum*.
Eutetranychus banksi (*nec* McGregor, 1914): Pritchard and Baker 1955: 115 (*partim*); Ehara 1963: 144, figs 1–10.
Eutetranychus orientalis: Baker and Pritchard 1960: 464, fig. 5; Ehara 1969b: 86, figs 4–11; Ehara and Lee 1971: 75, figs 48–50; Meyer 1974: 138, figs 566–573; Ehara and Wongsiri 1975: 150; Meyer 1987: 80, figs 377–390; Ehara and Tho 1988: 2; Ehara and Yogi 1998: 530, figs 1–4; Ehara 1999: 77.

The female of *E. orientalis* is distinctive in having the dorsal body setae short, widened distally, and set on small tubercles, and the first to fourth dorsocentral opisthosomal setae shorter than the other dorsal setae. The male is characterized by having the legs conspicuously long, and the aedeagus abruptly upturned posteriorly to form a short distal portion (Fig. 12).

According to Meyer (1974), African specimens of *E. orientalis* carry one tactile seta on coxa II; however, the Sumatran specimens, as well as specimens from Japan, Thailand, and the Philippines, are provided with two tactile setae on coxa II (cf. Corpuz-Raros 1989). On the other hand, specimens from Pakistan appear to bear only one tactile seta on coxa II (Chaudhri *et al.* 1974). It is thus possible that "*E. orientalis*" includes at least two species.

Specimens examined. Lubuk Mintrum: 6♂ and 8♀, 2-XII-1981, 2♂ and 6♀, 4-XII-1981, on a euphorbiaceous plant; 1♀, 3-XII-1981, on *Citrus nobilis* var. *microcapna* Hassk. (Rutaceae); 8♂ and 10♀, 4-XII-1981, 2♂ and 5♀, 7-XII-1981, on papaya, *Carica papaya* L., (Caricaceae).

Distribution. Japan (Okinawa Island, Tsuken I., Miyako I.), China, Taiwan, Philippines, Thailand, Malaysia; Indonesia (Sumatra), new record; India, Pakistan, Afghanistan, Iran, Israel, Jordan, Turkey, Cyprus, Africa, etc.

Hosts. According to Jeppson *et al.* (1975), this species is primarily a pest of citrus. However, it has been recorded to infest a wide variety of plants (cf. Bolland *et al.* 1998; Ehara 1999).

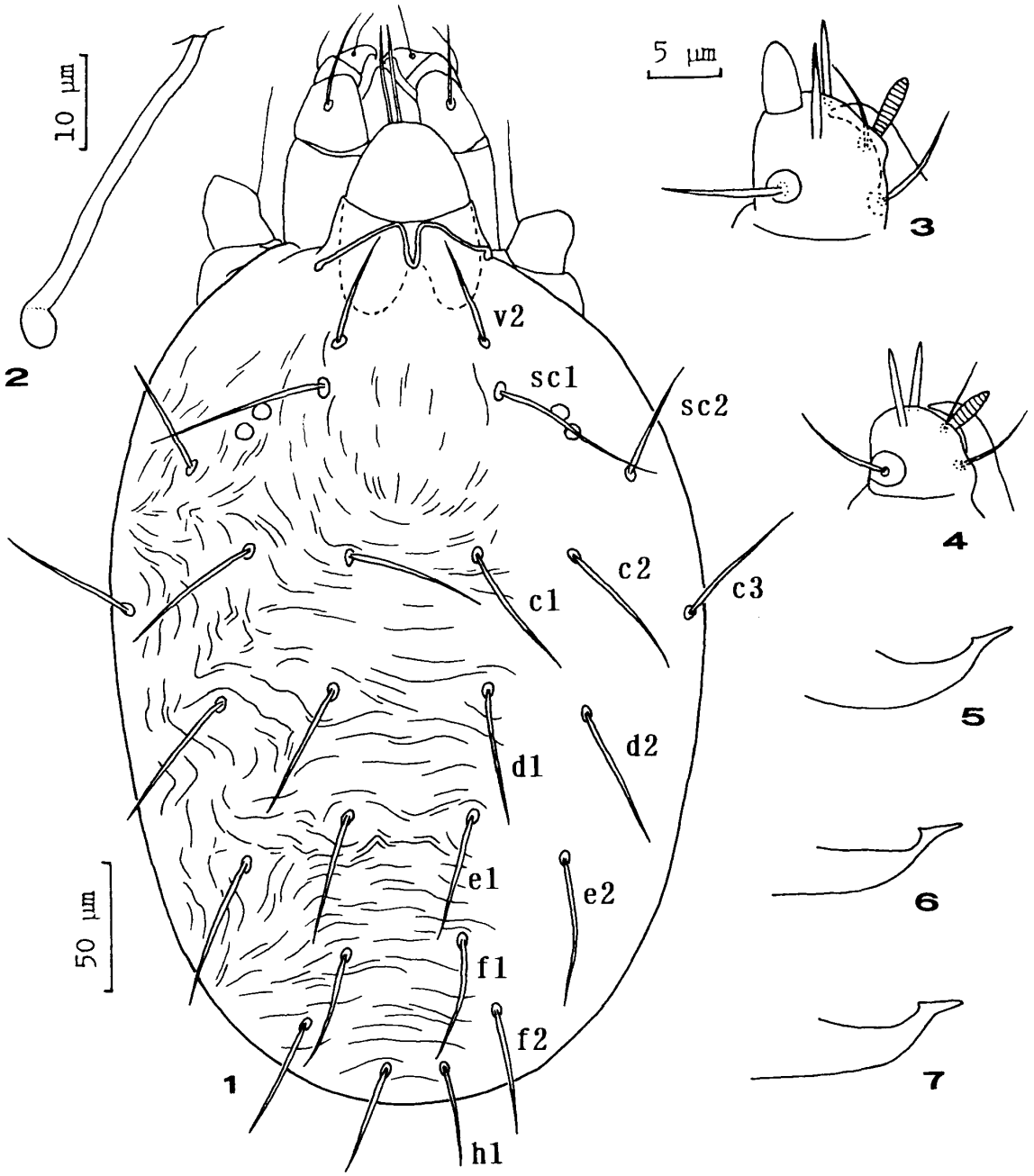
Schizotetranychus malayanus Ehara, 1988
(Figs 1–11)

Schizotetranychus malayanus Ehara in Ehara and Tho 1988: 6, figs 9–10, 15–18 (type locality: campus of Univ. of Malaya, Kuala Lumpur; type host: cassava, *Manihot esculenta* Crantz).

Description. *Female.* Body, including rostrum, 382 long, 205 wide. Most of dorsal body setae about as long as distances between consecutive setae (Fig. 1); lengths of setae (mean±SE, n=10): v2 45.9±0.6, sc1 69.1±1.0, sc2 49.7±0.7, c1 55.3±0.9, c2 58.1±0.8, c3 56.6±0.9, d1 56.5±1.3, d2 (n=9) 60.5±1.4, e1 52.1±0.8, e2 63.4±0.8, f1 50.2±0.6, f2 49.3±0.9, h1 42.5±0.4; 2nd pair of dorsocentral opisthosomal setae (d1) more widely spaced than 4th pair (f1). Opisthosomal striae of dorsocentral region

NII-Electronic Library Service

Japanese Society of Systematic Zoology

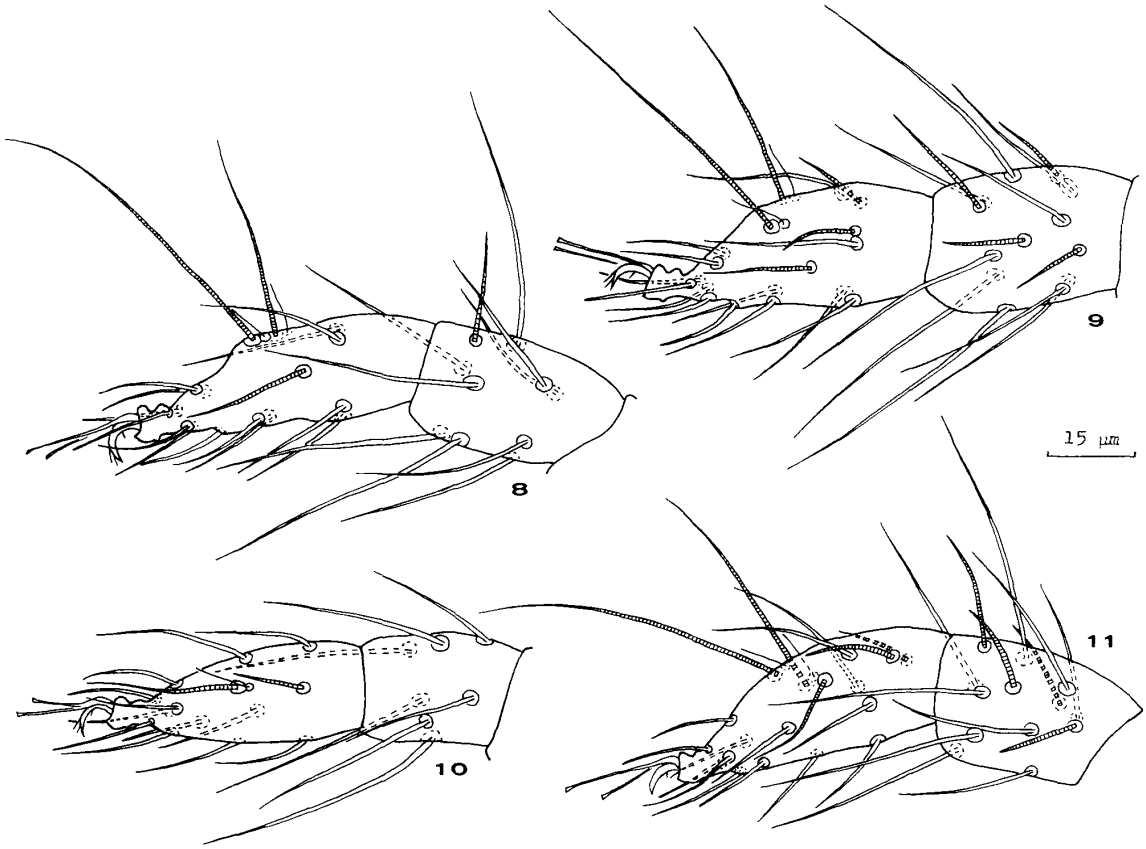


Figs 1–7. *Schizotetranychus malayanus* (3–7, all at same magnification). 1, dorsum (♀); 2, peritreme (♀), lateral view; 3, distal segment of palpus (♀); 4, ditto (♂); 5–7, aedeagi.

transverse (Fig. 1). Peritremes tobacco-pipe-shaped (Fig. 2). Genital flap with transverse striae; area immediately anterior to flap with transverse striae. Palpus with spinneret about twice as long as broad; dorsal sensillum (solenidion) fusiform, much smaller than spinneret (Fig. 3). Numbers of setae and solenidia (in parentheses) on leg podomeres: femora 9-7-4-3, genua 5-5-4-4, tibiae 9(1 or 3–4)-7-6-7, tarsi 13(1 or 2–3)+2 dupl.-12(1)+1 dupl.-9(1)-9(1). Tarsus I with 4 tactile setae and 1 solenidion (or 2–3 solenidia) proximal to duplex setae (Figs 8, 9); tarsus II with 2 tactile

NII-Electronic Library Service

Japanese Society of Systematic Zoology



Figs 8–11. *Schizotetranychus malayanus*. 8, tarsus and tibia I (♀, Ulu Gadut); 9, ditto (♀, Padang); 10, tarsus and tibia II (♀, Padang); 11, tarsus and tibia I (♂, Padang).

setae and 1 solenidion proximal to duplex setae (Fig. 10). Empodia with 2 fine dorsal hairs on each claw-like division.

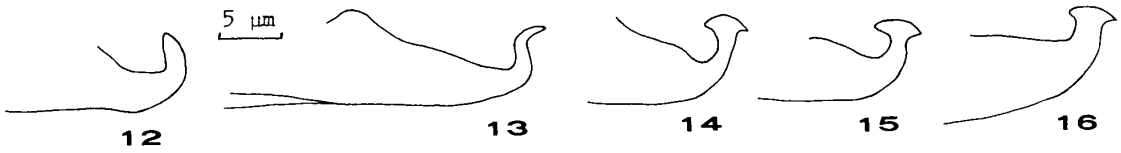
Male. Body, including rostrum, 285 long, 131 wide. Lengths of setae (n=10): v2 41.5±0.6, sc1 57.4±1.1, sc2 45.3±0.5, c1 (n=9) 48.1±1.0, c2 50.8±1.2, c3 52.1±0.9, d1 48.7±1.0, d2 54.7±0.8, e1 44.7±0.9, e2 55.1±1.4, f1 39.7±0.7, f2 24.8±0.4, h1 19.1±0.5. Aedeagus upturned distally; terminal knob slender, 3.0 long; anterior projection of knob minute, acute; posterior projection elongate, gently tapering; axis of knob forming slight angle with ventral margin of shaft, or subparallel with the latter (Figs 5–7). Palpus lacking spinneret (Fig. 4). Setae and solenidia (in parentheses) on leg segments: femora 9-7-4-3, genua 5-5-4-4, tibiae 9(4)-7-6-7, tarsi 13(3)+2 dupl.-12(1)+1 dupl.-9(1)-9(1). Tarsus I with 4 tactile setae and 3 solenidia proximal to duplex setae (Fig. 11); tarsus II with 2 tactile setae and 1 solenidion proximal to duplex setae. Empodium I with dorsal hair practically absent on claw-like division; empodia II–IV with 2 fine dorsal hairs on each claw-like division.

Specimens examined. Padang: 4♂ and 6♀, 2-XII-1981, on a leguminous weed; Ulu Gadut: 3♂ and 2♀, 7-XII-1981, on the same weed.

Remarks. *Schizotetranychus malayanus* was originally described only from males on cassava (Euphorbiaceae) in Malaysia. The female of this species is described for the first time, and the male is redescribed. The female is characterized by having the opisthosoma with transverse striae on the dorsocentral region, and

NII-Electronic Library Service

Japanese Society of Systematic Zoology



Figs 12–16. Aedeagi. 12, *Eutetranychus orientalis*; 13, *Schizotetranychus baltazari*; 14–16, *Tetranychus kanzawai*.

the dorsocentral opisthosomal setae about as long as the distances between consecutive setae. *Schizotetranychus malayanus* can be distinguished from its congeners by the aedeagus with a very small, slender terminal knob (Ehara and Tho 1988).

Female specimens of *S. malayanus* from Padang differ from those from Ulu Gadut in having tibia I with three or four solenidia and tarsus I with two or three solenidia (except duplex setae), instead of one solenidion each on tibia and tarsus I (Figs 8, 9). Moreover, the additional solenidia on the tarsus and tibia of female leg I are often found to form extra duplex setae associated with a tactile seta.

Recently *S. malayanus* was recorded from Indonesia on cassava, without showing the detailed localities (Bolland *et al.* 1998). It is reported for the first time in Sumatra.

Schizotetranychus baltazari Rimando, 1962
(Fig. 13)

Schizotetranychus baltazari Rimando, 1962a: 540, figs 3–4 (type locality: Calauan, Laguna, Philippines; type host: *Citrus nobilis* Lour.); Bolland *et al.* 1998: 162.
Schizotetranychus baltazarae: Rimando 1962b: 17, figs 7, 9–10; Manson 1967: 669; Lo and Hsia 1968: 267, figs 9–10; Ehara and Wongsiri 1975: 163, figs 38–44; Wang 1981: 58, fig. 42; Tseng 1990: 94, figs 236–245. [Unjustified emendation]
Schizotetranychus? *baltazari*: Manson 1963: 360, figs 45–55.

The female of this species exhibits the following characteristics: most of dorsal body setae shorter than distances between consecutive setae; 4th pair of dorsocentral opisthosomal setae (f1) much more widely spaced than 2nd pair (d1); opisthosomal striae longitudinal between d1 setae and between e1 setae; tibia I with 7 tactile setae (and 1 solenidion); tibia II with 5 tactile setae; aedeagus strongly upturned to form slender, sigmoid distal portion, with tip pointing caudad (Fig. 13).

Specimens examined. Lubuk Mintrum: 2♂ and 6♀, 15-XII-1981, on *Lansium domesticum* Corrêa (Meliaceae).

Distribution. China, Taiwan, Philippines, Thailand; Indonesia (Sumatra), new record; Myanmar, India.

Hosts. *Citrus*, *Dioscorea*, *Lansium*, *Murraya*.

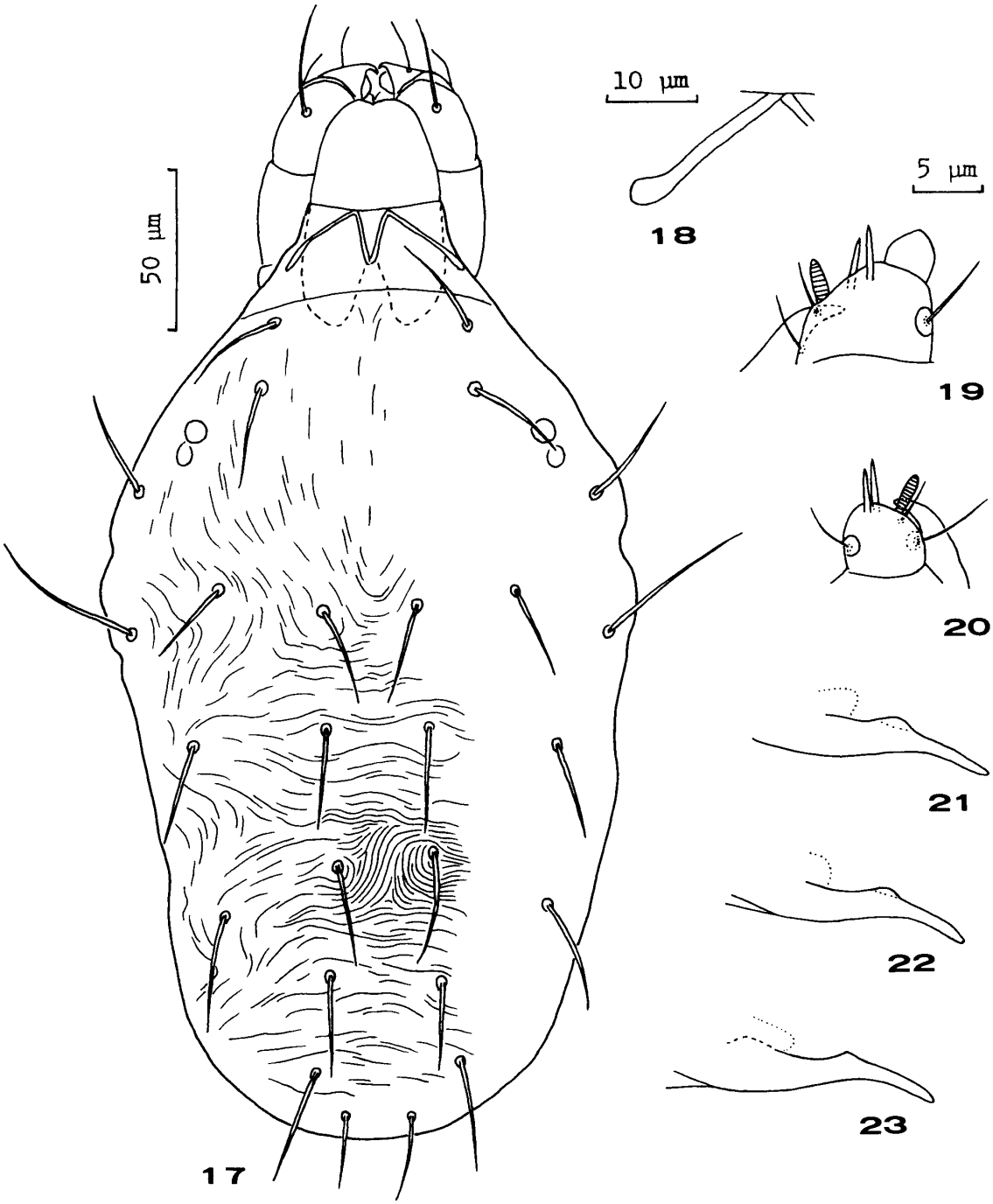
Oligonychus sumatranus sp. nov.
(Figs 17–27)

Description. *Female.* Body, including rostrum, 329 long, 170 wide. Most of dor-

NII-Electronic Library Service

Japanese Society of Systematic Zoology

sal body setae shorter than, or approximately as long as distances between consecutive setae (Fig. 17); lengths of setae (mean±SE, n=10): v2 (n=9) 31.7±0.5, sc1 35.7±0.8, sc2 38.5±0.7, c1 (n=9) 33.8±0.5, c2 28.0±0.5, c3 49.9±0.7, d1 35.0±0.3, d2 33.1±0.6, e1 34.7±0.5, e2 38.0±0.6, f1 32.7±0.5, f2 38.0±0.4, h1 (n=9) 27.9±0.4. Opisthosomal striae of dorsocentral region transverse except for longitudinal to inverted-



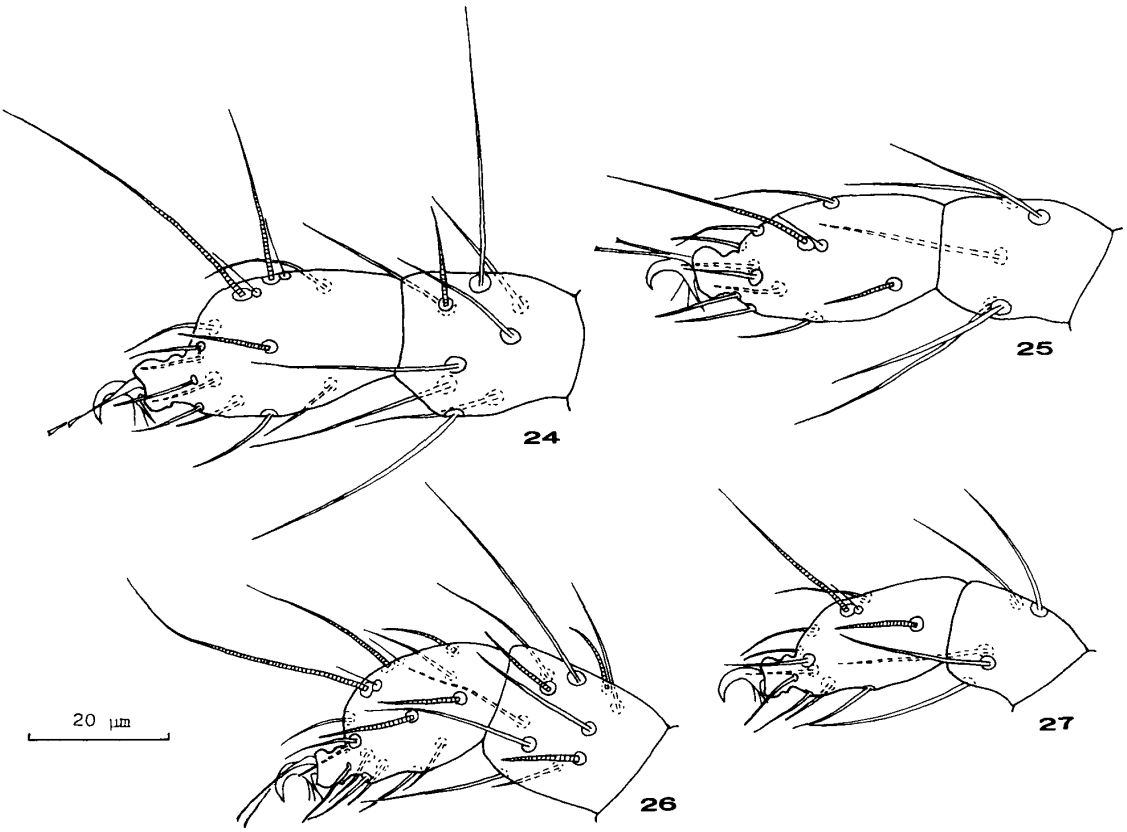
Figs 17–23. *Oligonychus sumatranus* sp. nov. (19–23, all at same magnification). 17, dorsum (♀); 18, peritreme (♀), dorsal view; 19, distal segment of palpus (♀); 20, ditto (♂, holotype); 21–23, aedeagi (21, holotype).

NII-Electronic Library Service

Japanese Society of Systematic Zoology

V pattern between e1 setae (Fig. 17). Peritremes with distal portion nearly straight, dilated at tip (Fig. 18). Genital flap with transverse striae; area immediately anterior to flap with transverse striae. Palpus with spinneret approximately pentagonal, about as long as broad; dorsal sensillum fusiform, subequal to spinneret in length (Fig. 19). Tarsi of legs abruptly declivate distally. Numbers of setae and solenidia (in parentheses) on leg segments: femora 8-7-3-2, genua 5-5-3-3, tibiae 8(1)-5-5-5, tarsi 10(1)+2 dupl.-9(1)+1 dupl.-7(1)-7(1). Tarsus I with 2 tactile setae proximal to duplex setae, and 1 tactile seta and 1 solenidion near level of duplex setae (Fig. 24); tarsus II with 1 solenidion proximad of duplex setae (Fig. 25). Empodial claws with 3 pairs of fine proximoventral hairs, most proximal pair nearly in contact with distal end of tarsus.

Male. Body, including rostrum, 287 long, 154 wide. Lengths of setae (n=10): v2 24.8±0.4 (25.7), sc1 29.4±0.6 (29.2), sc2 28.2±0.6 (28.0), c1 27.9±0.2 (27.7), c2 22.7±1.1 (20.1), c3 36.3±0.5 (35.0), d1 28.4±0.6 (29.4), d2 24.3±0.4 (24.3), e1 27.0±0.6 (26.5), e2 26.7±0.9 (29.0), f1 24.6±0.4 (24.5), f2 26.9±0.2 (26.3), h1 18.9±0.5 (20.5). Aedeagus with shaft bent downward at slight angle to form slender, nearly straight distal hook (Figs 21–23). Palpus lacking spinneret; dorsal sensillum typically fusiform (Fig. 20). Legs short, tarsi abruptly declivate distally. Numbers of setae and solenidia (in parentheses) on leg segments: femora 8-7-3-2, genua 5-5-3-3, tibiae 8(3)-5-5-5, tarsi 10(3)+2 dupl.-9(1)+1 dupl.-7(1)-7(1). Tarsus I with 2 tactile setae and 2 solenidia proximal to duplex setae, and 1 tactile seta and 1 solenidion near level of duplex setae



Figs 24–27. *Oligonychus sumatranus* sp. nov. 24, tarsus and tibia I (♀); 25, tarsus and tibia II (♀); 26, tarsus and tibia I (♂, holotype); 27, tarsus and tibia II (♂, holotype).

NII-Electronic Library Service

Japanese Society of Systematic Zoology

(Fig. 26); tarsus II with 1 solenidion proximal to duplex setae (Fig. 27). Empodial claws with 3 pairs of fine proximoventral hairs, most proximal pair nearly in contact with distal end of tarsus.

Specimens examined. Holotype: ♂ (NSMT-Ac 11676), Lubuk Mintrum, 15-XII-1981 (A. Takafuji leg.), on *Pithecellobium dulce* (Roxb.) Benth (Leguminosae). Paratypes: 2♂ (NSMT-Ac 11677, 11678), 2♀ (NSMT-Ac 11679, 11680), 2♂ (MZB), 2♀ (MZB), with the above data. Other specimens: 2♂ and 2♀ (my private collection), with the above data.

Remarks. *Oligonychus sumatranus* sp. nov. is assigned to the *O. peruvianus* species group ("*Homonychus*" group) because of having the female opisthosoma with transverse striae except for a longitudinal or inverted-V pattern between the third pair of dorsocentral setae. The new species is distinctive from the other known members of this group in that tibia I has eight tactile setae, and the distal hook of the aedeagus is long and slender, nearly straight, and caudoventrally directed.

Etymology. Pertaining to the island of Sumatra.

Tetranychus kanzawai Kishida, 1927
(Figs 14–16)

Tetranychus kanzawai Kishida, 1927: 105 (type locality: Yamanashi Pref.; type host: mulberry, *Morus* sp.); Ehara 1956: 504, figs 15–25; Ehara and Masaki 1989: 52, fig. 14; Ehara 1999: 129, fig. 190.

The aedeagus of *T. kanzawai* is characterized by a large terminal knob which is 3.9 μm in diameter and with an approximately semicircular dorsal margin (Figs 14–16). A cassava mite species from Java, which was referred to as *T. hydrangeae* Pritchard and Baker, 1955 (Flechtmann 1981), is probably *T. kanzawai*.

Specimens examined. Lubuk Mintrum: 7♂ and 8♀, 9-XII-1981, on cassava; Padang: 2♂ and 6♀, 9-XII-1981, 2♂ and 2♀, 15-XII-1981, on cassava.

Distribution. Japan, Korea, China, Taiwan, Thailand, Malaysia, Philippines, Indonesia (Java; Sumatra, new record), Australia.

Hosts. A wide variety of plants, including many economic ones, have been recorded as hosts of *T. kanzawai* (cf. Bolland *et al.* 1998; Ehara 1999).

Acknowledgements

I wish to thank Dr. A. Takafuji, Professor of the Graduate School of Agriculture, Kyoto University, for furnishing me with the present specimens he collected. His survey of Sumatran mites was supported by a Grant-in-Aid for Overseas Scientific Survey from the Ministry of Education, Culture, Sports, Science and Technology, Japan (No. 56041027). My appreciation is also due to Dr. Y. Hirashima (Professor Emeritus, Kyushu University) for his valuable suggestions about the International Code of Zoological Nomenclature, to Dr. B. Vierbergen (Plantenziektenkundige Dienst, Wageningen, the Netherlands) for help in literature, and to anonymous reviewers who made helpful suggestions.

NII-Electronic Library Service

Japanese Society of Systematic Zoology

References

Baker, E. W. and Pritchard, A. E. 1960. The tetranychoid mites of Africa. Hilgardia 29: 455–574.

Bolland, H. R., Gutierrez, J. and Flechtmann, C. H. W. 1998. *World Catalogue of the Spider Mite Family* (*Acari*: *Tetranychidae*). Brill, Leiden, 392 pp.

Chaudhri, W. M., Akbar, S. and Rasool, A. 1974. *Taxonomic Studies of the Mites Belonging to the Families Tenuipalpidae, Tetranychidae, Tuckerellidae, Caligonellidae, Stigmaeidae and Phytoseiidae*. University of Agriculture, Lyallpur, Pakistan, xvi+250 pp.

Corpuz-Raros, L. A. 1989. Hosts, geographic distribution and predatory mite associations of Philippine phytophagous mites (Acari). The Philippine Agriculturist 72: 303–322.

Ehara, S. 1956. Tetranychoid mites of mulberry in Japan. Journal of the Faculty of Science, Hokkaido University, Series 6, Zoology 12: 499–510.

Ehara, S. 1963. Notes on spider mites in the collection of the Zoological Survey of India, Calcutta (Acarina: Tetranychidae). Records of the Indian Museum 59: 142–148.

Ehara, S. 1969a. Spider mites of sugar cane in eastern Asia. Journal of the Faculty of Education, Tottori University, Natural Science 20: 19–25.

Ehara, S. 1969b. The tetranychoid mites of Taiwan (Acarina: Prostigmata). Journal of the Faculty of Education, Tottori University, Natural Science 20: 79–103.

Ehara, S. 1999. Revision of the spider mite family Tetranychidae of Japan (Acari, Prostigmata). Species Diversity 4: 63–141.

Ehara, S. and Lee, L. H. Y. 1971. Mites associated with plants in Hong Kong. Journal of the Faculty of Education, Tottori University, Natural Science 22: 61–78.

Ehara, S. and Masaki, M. 1989. Notes on two Japanese species of *Tetranychus* (Acarina: Tetranychidae). Acta Arachnologica 38: 49–54.

Ehara, S. and Tho, Y. P. 1988. Spider mites of the Malay Peninsula (Acari: Tetranychidae). Journal of the Faculty of Education, Tottori University, Natural Science 37: 1–24.

Ehara, S. and Wongsiri, T. 1975. The spider mites of Thailand (Acarina: Tetranychidae). Mushi 48: 149–185.

Ehara, S. and Yogi, K. 1998. Discovery of *Eutetranychus orientalis* (Klein) (Acari, Tetranychidae) from Okinawa Island, Japan. Plant Protection (Tokyo) 52: 530–533. [In Japanese]

Flechtmann, C. H. W. 1981. The cassava mite complex. II. New records and description of two new species in the genus *Tetranychus* from Asia. International Journal of Acarology 7: 81–86.

Gutierrez, J. 1992. Les acariens déprédateurs du cotonnier. Coton et Fibres Tropicales 47: 153–172.

Gutierrez, J., Helle, W. and Bolland, H. R. 1979. Etude d'une souche de *Tetranychus piercei* (Acariens: Tetranychidae), d'Indonésie: redescription, caryotype et reproduction. Entomologische Berichten 39: 88–94.

Jeppson, L. R., Keifer, H. H. and Baker, E. W. 1975. *Mites Injurious to Economic Plants*. University of California Press, Berkeley, xxiv+614 pp., 63 pls.

Johnston, D. E. and Flechtmann, C. H. W. 1990. On the genus *Aponychus* (Acari: Tetranychidae) in Java. International Journal of Acarology 16: 247.

Kalshoven, L. G. E. and Van der Vecht, J. 1950. *De Plagen van de Cultuurgewassen in Indonesië. Deel I*. W. van Hoeve, 's-Gravenhage, 512 pp. (Acarina: pp. 68–90+1 pl.)

Kishida, K. 1927. Notes on *Tetranychus kanzawai* n. sp., a new tetranychid mite injurious to leaves of the mulberry tree in Japan. Zoological Magazine 39: 105–107. [In Japanese]

Klein, H. Z. 1936. Contributions to the knowledge of the red spiders in Palestine. 1. The Orien-

NII-Electronic Library Service

Japanese Society of Systematic Zoology

tal red spider, *Anychus orientalis* Zacher. Hadar 9: 107–112, 126–132.

Lindquist, E. E. 1985. Anatomy, phylogeny and systematics. 1. 1. 1. External Anatomy. Pp. 3–28. *In*: Helle, W. and Sabelis, M. W. (Eds) *Spider Mites. Their Biology, Natural Enemies and Control. Vol. 1A*. Elsevier, Amsterdam, xviii+405 pp.

Lo, P. K. C. and Hsia, D. N. T. 1968. Tenuipalpid and tetranychid mites infesting citrus in Taiwan, and life history study of the citrus geen mite, *Schizotetranychus baltazarae* Rimando. Bulletin of the Sun Yat-sen Cultural Foundation 1: 253–274.

Manson, D. C. M. 1963. Mites of the families Tetranychidae and Tenuipalpidae associated with citrus in South East Asia. Acarologia 5: 351–364.

Manson, D. C. M. 1967. Mites of the families Tenuipalpidae and Tetranychidae intercepted entering New Zealand from overseas. New Zealand Journal of Science 10: 664–674.

Masaki, M. 1991. A list of Acarina intercepted in plant quarantine. Research Bulletin of the Plant Protection of Japan 27: 87–92. [In Japanese]

McGregor, E. A. 1914. Four new tetranychids. Annals of the Entomological Society of America 7: 354–364.

Meyer, M. K. P. (Smith) 1974. A revision of the Tetranychidae of Africa (Acari) with a key to the genera of the world. Entomology Memoir, Department of Agricultural Technical Services, Republic of South Africa 36: 1–291.

Meyer, M. K. P. (Smith) 1987. African Tetranychidae (Acari: Prostigmata)—with reference to the world genera. Entomology Memoir, Department of Agriculture and Water Supply, Republic of South Africa 69: i–iv+1–175.

Pritchard, A. E. and Baker, E. W. 1955. A revision of the spider mite family Tetranychidae. Pacific Coast Entomological Society, Memoirs Series 2: 1–472.

Rimando, L. C. 1962a. Four new species of spider mites of the genera *Eotetranychus* and *Schizotetranychus* (Tetranychidae, Acarina). The Philippine Agriculturist 45: 535–544.

Rimando, L. C. 1962b. The tetranychoid mites of the Philippines. University of the Philippines, College of Agriculture, Technical Bulletin 11: 1–52.

Tseng, Y. H. 1990. A monograph of the mite family Tetranychidae (Acarina: Trombidiformes) from Taiwan. Taiwan Museum Special Publication Series (9): 1–224.

Wang, H. 1981. Acariformes: Tetranychoidea. Economic Insect Fauna of China (23): i–v+1–150, pls 1–4. [In Chinese]

Zehntner, L. 1897. Overzicht van de Ziekten van het Suikerriet op Java. 2^{e} deel. Archief voor de Java-Suikerindustrie 5: 525–575.

NII-Electronic Library Service